

and a notable range extension for Ontario. One new combination is proposed in the genus *Gymnocarpium*.

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Chromosome Counts in Some British Columbia Ferns

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During the past 15 years pteridologists have been turning increasingly to cytology for help in unravelling taxonomic problems and for better insight into phylogenetic relationships. Manton's (1950) pioneer and classical work charted a course that has proven to be both intellectually stimulating and philosophically rewarding. She and her students have given us a very compre-

hensive picture of the chromosome situation in most European species, and many tropical ones as well.

The pioneering work on chromosome numbers on this continent has been done by Britton (1953) and Wagner (1954, 1955). Thanks largely to their efforts we have a fairly complete knowledge of the chromosome situation in the majority of eastern American species. Comparable data from the Pacific Coast region are, however, almost entirely lacking. The present report is the first of a study planned to remedy this deficiency. It includes only data from British Columbian populations but in course of time others will be added.

MATERIALS AND METHODS

The method used followed the aceto-carminic squash technique method outlined by Manton (1950) with a few modifications. Portions of the fertile fronds were fixed in acetic acid: alcohol for 12-25 hours and then stained in aceto-carminic. The squashes were made with a pair of Bernard pliers with the jaws padded and several pieces of filter paper, cut to proper size, placed between the jaws to absorb excess stain. The squash was made immediately after heating the stain on the slide almost to the boiling point.

Since it was difficult to keep the material in acetic acid: alcohol for any length of time, later collections were fixed in Newcomber's solution and stained in aceto-orcin as suggested by Wagner (1955). This method is more satisfactory.

Most of the cytological material was taken from plants now growing in the greenhouse of the University of British Columbia. Some of the plants are well established cultures several years old while others were brought from the field during the past summer.

All voucher specimens are deposited in the University of British Columbia Herbarium. The numbers are collection numbers of either the senior (T.M.C.T.) or the junior (F.A.L.) author. In most cases clones from which the specimens were taken are growing in the greenhouse. All counts were made by the

junior author and are based on meiotic stages. The results are reported in the table below.

Among these, the writers have failed to find previous reports of chromosome numbers for *Polystichum andersonii*, *P. lemmonii*, *P. munitum*, and *Thelypteris nevadensis*. All are consistent with the generally accepted basic number of the various genera; *Polystichum andersonii* is tetraploid. *Thelypteris nevadensis* appears to be variable, sometimes giving counts of 26 and sometimes 27, which is a matter that should be investigated further. *Thelypteris oreopteris* has not been counted before from North America but agrees with Manton's (1950) results from European material. *Cryptogramma crispa* var. *acrostichoides*, also a new report for North America, is diploid and not tetraploid as found to be the case in Europe by Manton (1950). Particular attention has been paid to the variable *Polypodium vulgare* complex; numerous widely distributed populations within the province

TABLE 1.

<i>Taxon</i>	<i>Voucher</i>	<i>n</i>	<i>Locality</i>
<i>Asplenium viride</i> Huds.	FAL 42	36	Moresby Is., Queen Charlotte Islands
<i>Athyrium alpestre</i> (Hoppe) Rylands	FAL 14	40	Mt. Revelstoke
<i>Cryptogramma crispa</i> (L.) R. Br. var. <i>acrostichoides</i> (R. Br.) C. B. Clarke	FAL 175	40	Pitt River Mt. Seymour
<i>Dryopteris fragrans</i> (L.) Schott	TMCT 6040	41	Cassiar
<i>Polypodium scouleri</i> Hook. & Grev.	FAL 8	37	Sooke
<i>Polypodium vulgare</i> L. s.l.	FAL 178	37	Mt. Seymour and many other collections
<i>Polystichum andersonii</i> Hopkins	FAL 11	82	Smithers
<i>Polystichum braunii</i> (Spenner) Fée	TMCT 6004	82-84	Gerrard
<i>Polystichum lemmonii</i> Maxon	TMCT 3214	41	Westbridge
<i>Polystichum munitum</i> (Klf.) Presl, f. <i>imbricans</i> (Eaton) Clute	TMCT 3217	41	Sooke
<i>Thelypteris nevadensis</i> (D. C. Eaton) Clute	TMCT 3219	26 or 27	Sooke
<i>Thelypteris oreopteris</i> (Ehrh.) Slosson	TMCT 3216	34	Kennedy Lake
<i>Woodsia ilvensis</i> (L.) R. Br.	TMCT 6032	40-41	Telkwa

have proven to be uniformly diploid. In view of our experience the report by Knobloch (1962) of a tetraploid race in Arizona, and of *P. californicum* and *P. hesperium* by Lloyd (1963), is most interesting. It is also of interest to note that *Polypodium virginianum* of eastern North America has tetraploid as well as diploid races (Britton, 1953).

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Shorter Notes

THE EFFECT OF PHOTOPERIOD ON CERTAIN FERNS.—Several kinds of ferns have been grown in the Hollins College greenhouse for several years for class demonstration purposes. Of a number of species transplanted from nearby localities, three (*Asplenium platyneuron*, *Woodsia obtusa*, and *Polystichum acrostichoides*) survived; these evidently do not need a period of frost to break fall dormancy. Two other ferns were added, *Adiantum capillus-veneris*, procured from a dealer, and *Pteris vittata*,¹ which appeared as an accidental in pots of other plants that had been purchased. In addition, *Dennstaedtia punctilobula*, *Osmunda cinnamomea*, *Athyrium asplenioides*, and *Dryopteris noveboracensis* were collected from a mountain roadside before occurrence of frost.

A set of the greenhouse ferns was placed on the floor where the

¹ Identification by C. V. Morton, of the Smithsonian Institution.

plants received full winter illumination of normal day length and duplicate sets were planted on a bench in a second greenhouse room where artificial illumination by two 75 watt light bulbs were turned on by a time clock at 5 P.M. and off at 11 P.M. These arrangements gave various day lengths as the sun rose earlier, and with the approach of the equinox resulted in day lengths of 15 to 16 hours. Ferns collected from the mountain roadside were placed under the same conditions with a duplicate of each set put outside the greenhouse in gallon tin cans. These were returned to the greenhouse on March 7th and placed under long and short photoperiods.

The plants under the short photoperiod, the natural day length varying from approximately 9 to 12 hours as the equinox was approached, were grown in a room where the thermostat was set to turn on heat at 62° F. The plants under the long photoperiod were in a room with the thermostat set at 68° F. During the day, when sunny, the venting thermostats were set at 75° F., so the temperatures of the two rooms were about the same. The cooler condition for the plants under the short photoperiods did not prevent growth when temperatures slumped, although growth was slower under the cooler conditions. The experiment ended at the equinox, although no substantial change occurred before the last of April.

Pteris proved neutral to day-length, growing and sporulating under both photoperiods. *Adiantum* grew under both photoperiods, but sporulated only under the long day. *Asplenium*, *Woodsia*, and *Dryopteris* showed little or no growth under short photoperiods, but grew under the long photoperiod, although they were sterile, whereas *Polystichum* sporulated abundantly. The others failed to grow under either photoperiod and it is assumed that they need cold to break vegetative dormancy. The duplicates subjected to cold and returned to the greenhouse on March 7th, except for *Dennstaedtia*, also failed to grow. It is presumed that they were destroyed in the unprotected pots during several prolonged cold periods, for they had decayed when examined. The

Dennstaedtia that grew was under the long photoperiod; its copious fronds were sterile.

After the experiment was terminated, it was noted that *Asplenium* and *Woodsia*, growing in another part of the greenhouse, grew and sporulated about the end of April. As days had lengthened to between 13 and 14 hours, it is presumed that these plants responded to an intermediate photoperiod.—PAUL M. PATTERSON AND A. SEWELL FREEMAN, *Hollins College, Hollins College, Virginia*.

SOME NEW YORK CITY NATIVE FERNS.—One of New York City's five boroughs remains a place where a number of native ferns still grow wild. A recent paper¹ reports a total of 24 species of ferns and four fern associates still growing outside of cultivation on Staten Island. The borough retains a number of non-settled areas where some of the commoner ferns are relatively abundant.

The article makes careful comparisons between the authors' finds with those of Dr. Philip Dowell, who made a meticulous survey of Staten Island ferns during the period between 1902 and 1912. Faden and Weingartner's total tally of species is slightly smaller than Dowell's. The latter found 26 ferns, six fern allies, and 10 forms of *Dryopteris* that he considered interspecific hybrids. Three ferns and two fern allies not found by Dowell have been reported from Staten Island between 1912 and 1952. Only one of these, *Lycopodium adpressum*, is known still to grow on the island.

Whereas Dowell found 10 *Dryopteris* hybrids, Faden and Weingartner can record only one, *Dryopteris intermedia* × *spinulosa*. *Dryopteris clintoniana* and *D. marginalis*, both reported by Dowell, have disappeared.

I had the pleasure of becoming acquainted with some coastal species and several fern hybrids under Dowell's guidance beginning in 1906.—RALPH C. BENEDICT.

¹ Faden, Robert, and Mathilde Weingartner. 1962. The Ferns of Staten Island. *Bull. Torrey Club* 89: 333-335.

Notes and News

An enthusiastic student of ferns living in Australia wishes to correspond and exchange specimens with a resident of the United States. Anyone with a desire to obtain specimens from that part of the world and to participate in exchange of ideas, cultural notes dealing with ferns, etc., should write to Mr. H. Aubrey, Angophora Crescent, Forrestville, Sydney, N. S. W., Australia. Mr. Aubrey has joined the American Fern Society and is listed among the new members in this issue. [I. L. W.]

Members who participated in the Fern Foray into Mendocino and Humboldt counties, California, in the summer of 1957 will remember Mrs. Ora M. Wilson, her wit, cheerfulness, and enthusiasm. They, and other friends who enjoyed Ora Wilson's courageous and light-hearted approach to life and its problems, will be saddened by word that she passed away on April 26, 1963.

Recent Fern Literature

CYTOLOGY OF SOME INDIAN POLYPODIACEAE.—Some time ago I reviewed a number of papers on the cytology of various Indian fern-allies.¹ A more recent paper² contributed data on the chromosome numbers of several members of the Polypodiaceae *sens. strict.* In a few instances Panigrahi and Patniak have found different basic chromosome numbers from those given by Manton³ in 1955. In *Lepisorus* (J. Smith) Ching, Manton found numbers of $x = 35, 36,$ and 37 in three species from Ceylon; Panigrahi and Patniak find $x = 35$ in two species from eastern India,⁴ but $x = 13$ for the autotriploid *L. pseudonudus* Ching, and $x = 11$ for a new species, the lowest basic number for a true fern. *Loxogramme* (Blume) Presl, for which Pichi-

¹THIS JOURNAL 49: 39-43. 1959.

²Panigrahi, G. and S. N. Patniak. Cytology of Some Genera of Polypodiaceae in Eastern India. *Nature* 191 (4794): 1207, 1808, 1 fig. Sept. 16, 1961.

³Manton, I., in Holttum. *Flora Malaya* 2: 623-627. 1955.

⁴However, only one species, *L. excavatus* (Bory) Ching, is shown in their Table 1.

Sermolli⁵ gave a number of $x = 36$ based on a vague assumption made by Manton and Sledge,⁶ is here shown to have $x = 35$.

Panigrahi and Patniak adduce some cytological facts in support of recent taxonomic conclusions. The number $n = 36$ for *Drynaria coronans* (Wall. ex Mett.) J. Smith as against $n = 37$ in three other species of *Drynaria* investigated by Manton and Sledge supports Ching's view that this species forms a separate monotypic genus *Pseudodrynaria* Ching. On the other hand, Holttum's view that *Arthromeris* (Moore) J. Smith and *Crypsinus* Presl ought to be merged is not supported by cytological findings, since the three species of *Crypsinus*⁷ investigated show numbers of $n = 36, 35,$ and 33 whereas *Arthromeris wallichiana* (Spreng.) Ching has $n = 37$. The basic numbers for *Pyrrosia* Mirbel ($n = 36$) and *Microsorium* Link ($n = 36$) given by Manton and Sledge are verified by Panigrahi and Patniak. These authors have established for the first time the basic numbers of *Arthromeris*, *Colysis*, *Loxogramme*, and *Pseudodrynaria*. The following table gives their results:

<i>Arthromeris wallichiana</i> (Spreng.) Ching	$n = 37$ [diploid]
<i>Colysis elliptica</i> (Thunb.) Ching var. <i>pothifolia</i> (D. Don) Ching	$n = 36$ [diploid]
<i>Crypsinus crenato-pinnatus</i> (Clarke) Copel.	$n = 36$ [diploid]
<i>Crypsinus oxylobus</i> (Kunze) Sledge	$n = 35$ [diploid]
<i>Lepisorus excavatus</i> (Bory) Ching	$n = 35$ [diploid]
<i>Loxogramme avenia</i> (Blume) Presl	$n = 35$ [diploid]
<i>Loxogramme involuta</i> (D. Don) Presl	$n = 70$ [tetraploid]
<i>Loxogramme lanceolata</i> (Swartz) Presl	$n = 35$ [diploid]
<i>Loxogramme scolopendrina</i> (Bory) Presl	$n = 35$ [diploid]
<i>Microsorium membranaceum</i> (D. Don) Ching	$n = 36$ [diploid]
<i>Microsorium pteropus</i> (Blume) Copel.	$n = 36$ [diploid]
<i>Microsorium superficiale</i> (Blume) Ching	$n = 36$ [diploid]
<i>Pseudodrynaria coronans</i> (Wall. ex Mett.) Ching	$n = 36$ [diploid]
<i>Pyrrosia flocculosa</i> (D. Don) Ching	$n = 36$ [diploid]
<i>Pyrrosia mannii</i> (Giesenh.) Ching	$n = 37$ [diploid]

⁵Vistas in Botany 479. 1959.

⁶Phil. Trans. Roy. Soc. London, ser. B, 238: 171. 1954.

⁷However, only two species of *Crypsinus* are listed in Table 1.